

DRAFT

**Total Encounters and Mortality Estimates for
Puget Sound Recreational Chinook Mark-Selective Fisheries
Monitored using Baseline Sampling: 2011-2012**

Revised Draft – 12/24/2014

Prepared by:

Mark Baltzell, Jon Carey, Karen Kloempken and Laurie Peterson

**Washington Department of Fish and Wildlife
Fish Program
600 Capitol Way North
Olympia, Washington 98501**

This page left blank intentionally

TABLE OF CONTENTS

TABLE OF CONTENTS.....	iii
LIST OF TABLES.....	iv
LIST OF FIGURES.....	viii
INTRODUCTION.....	1
1 2011-12 Marine Area 12 Winter Mark-Selective Chinook Fishery.....	4
2 2012 Marine Area 6 Summer Mark-Selective Chinook Fishery.....	8
3 2012 Marine Area 12 Summer Mark-Selective Chinook Fishery.....	12
4 2012 Marine Area 13 Summer Mark-Selective Chinook Fishery.....	16
REFERENCES.....	20

LIST OF TABLES

Table 1	CRC-based total Chinook harvest estimates and variances for each Baseline-sampled Chinook MSF in Puget Sound between October 1, 2011 and September 30, 2012, along with the recommended estimation method based on VTR sample sizes and the resulting precision of encounters estimates.....	2
Table 1.1	Number of Chinook retained and released by mark-status, number of other salmon (positively identified species other than Chinook) released and number of salmon of unidentified species released, from dockside interviews conducted during Baseline Sampling of the Area 12 Chinook MSF from February 1 – April 30, 2012. AD = marked (adipose-clipped), UM = unmarked, UK = unknown mark.	4
Table 1.2	Summary of VTR encounters and harvested Chinook sampled during dockside sampling for the Area 12 Chinook MSF from February 1 - April 30, 2012. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.	4
Table 1.3	Summary of season-wide fishery impact estimates for the Area 12 Chinook MSF from February 1 - April 30, 2012. Release mortality rate = 0.15 for legal fish and 0.20 for sublegal fish. Values may not add up exactly due to rounding error. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.	4
Table 1.4	Comparison of modeled (FRAM model run 1811) and estimated total Chinook encounters for the Area 12 Chinook MSF from February 1 - April 30, 2012. Values may not add up exactly due to rounding error. AD = marked (adipose-clipped), UM = unmarked.....	5
Table 1.5	Comparison of modeled (FRAM model run 1811) and estimated total Chinook mortalities for the Area 12 Chinook MSF from February 1 - April 30, 2012. Values may not add up exactly due to rounding error. AD = marked (adipose-clipped), UM = unmarked.....	5
Table 1.6	Season total sample rate (Total retained Chinook sampled during baseline sampling / Estimated retained Chinook) in the Area 12 Chinook MSF from February 1 - April 30, 2012. AD = marked (adipose-clipped), UM = unmarked.....	6
Table 1.7	Summary of double-index tagged (DIT) Chinook kept by anglers, and estimated total mortality of unmarked DIT Chinook due to hook-and-release impacts resulting from the Area 12 Chinook MSF from February 1 - April 30, 2012. AD = marked (adipose-clipped), UM = unmarked.....	7
Table 1.8	Season-total estimates of Chinook encounters by size/mark-status and total estimates of angler effort, summarized for all previous seasons of the Area 12 winter Chinook MSF. Values may not add exactly due to rounding error. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.	7

Table 2.1 Summary of VTR encounters and harvested Chinook sampled during dockside sampling for the Area 6 Chinook MSF from July 1 - August 15, 2012. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.8

Table 2.2 Summary of season-wide fishery impact estimates for the Area 6 Chinook MSF from July 1 - August 15, 2012. Release mortality rate = 0.15 for legal fish and 0.20 for sublegal fish. Values may not add up exactly due to rounding error. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.8

Table 2.3 Comparison of modeled (FRAM model run 1512) and estimated total Chinook encounters for the Area 6 Chinook MSF from July 1 - August 15, 2012. Values may not add up exactly due to rounding error. AD = marked (adipose-clipped), UM = unmarked.8

Table 2.4 Comparison of modeled (FRAM model run 1512) and estimated total Chinook mortalities for the Area 6 Chinook MSF from July 1 - August 15, 2012. Values may not add up exactly due to rounding error. AD = marked (adipose-clipped), UM = unmarked.9

Table 2.5 Season total sample rate (Total retained Chinook sampled during baseline sampling / Estimated retained Chinook) in the Area 6 Chinook MSF from July 1 - August 15, 2012. AD = marked (adipose-clipped), UM = unmarked.10

Table 2.6 Summary of double-index tagged (DIT) Chinook kept by anglers, and estimated total mortality of unmarked DIT Chinook due to hook-and-release impacts resulting from the Area 6 Chinook MSF from July 1 - August 15, 2012. AD = marked (adipose-clipped), UM = unmarked.10

Table 2.7 Season-total estimates of Chinook encounters by size/mark-status and total estimates of angler effort, summarized for all previous seasons of the Area 6 summer Chinook MSF. Values may not add exactly due to rounding error. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.11

Table 3.1 Number of Chinook retained and released by mark-status, number of other salmon (positively identified species other than Chinook) released and number of salmon of unidentified species released, from dockside interviews conducted during Baseline Sampling of the Area 12 Chinook MSF from July 1 – September 30, 2012. AD = marked (adipose-clipped), UM = unmarked, UK = unknown mark.12

Table 3.2 Summary of VTR encounters and harvested Chinook sampled during dockside sampling for the Area 12 Chinook MSF from July 1 - September 30, 2012. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.12

Table 3.3 Summary of season-wide fishery impact estimates for the Area 12 Chinook MSF from July 1 - September 30, 2012. Release mortality rate = 0.15 for legal fish and 0.20 for sublegal fish. Values may not add up exactly due to rounding error. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.12

Table 3.4 Comparison of modeled (FRAM model run 1512) and estimated total Chinook encounters for the Area 12 Chinook MSF from July 1 - September 30, 2012. Values may not add up exactly due to rounding error. AD = marked (adipose-clipped), UM = unmarked.....13

Table 3.5 Comparison of modeled (FRAM model run 1512) and estimated total Chinook mortalities for the Area 12 Chinook MSF from July 1 - September 30, 2012. Values may not add up exactly due to rounding error. AD = marked (adipose-clipped), UM = unmarked.....13

Table 3.6 Season total sample rate (Total retained Chinook sampled during baseline sampling / Estimated retained Chinook) in the Area 12 Chinook MSF from July 1 - September 30, 2011. AD = marked (adipose-clipped), UM = unmarked.14

Table 3.7 Summary of double-index tagged (DIT) Chinook kept by anglers, and estimated total mortality of unmarked DIT Chinook due to hook-and-release impacts resulting from the Area 12 Chinook MSF from July 1 - September 30, 2012. AD = marked (adipose-clipped), UM = unmarked.....15

Table 4.1 Number of Chinook retained and released by mark-status, number of other salmon (positively identified species other than Chinook) released and number of salmon of unidentified species released, from dockside interviews conducted during Baseline Sampling of the Area 13 Chinook MSF from May 1 – September 30, 2012. AD = marked (adipose-clipped), UM = unmarked, UK = unknown mark.16

Table 4.2 Summary of VTR encounters and harvested Chinook sampled during dockside sampling for the Area 13 Chinook MSF from May 1 - September 30, 2012. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.16

Table 4.3 Summary of season-wide fishery impact estimates for the Area 13 Chinook MSF from May 1 - September 30, 2012. Release mortality rate = 0.15 for legal fish and 0.20 for sublegal fish. Values may not add up exactly due to rounding error. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.16

Table 4.4 Comparison of modeled (FRAM model run 1512) and estimated total Chinook encounters for the Area 13 Chinook MSF from May 1 - September 30, 2012. Values may not add up exactly due to rounding error. AD = marked (adipose-clipped), UM = unmarked.....17

Table 4.5 Comparison of modeled (FRAM model run 1512) and estimated total Chinook mortalities for the Area 13 Chinook MSF from May 1 - September 30, 2012. Values may not add up exactly due to rounding error. AD = marked (adipose-clipped), UM = unmarked.....17

Table 4.6	Season total sample rate (Total retained Chinook sampled during baseline sampling / Estimated retained Chinook) in the Area 13 Chinook MSF from May 1 - September 30, 2012. AD = marked (adipose-clipped), UM = unmarked.	18
Table 4.7	Summary of double-index tagged (DIT) Chinook kept by anglers, and estimated total mortality of unmarked DIT Chinook due to hook-and-release impacts resulting from the Area 13 Chinook MSF from May 1 - September 30, 2012. AD = marked (adipose-clipped), UM = unmarked.....	19
Table 4.8	Season-total estimates of Chinook encounters by size/mark-status and total estimates of angler effort, summarized for all previous seasons of the Area 13 summer Chinook MSF. Values may not add exactly due to rounding error. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.	19

LIST OF FIGURES

Figure 1	Beta regression results displaying the relationship between the released-to-retained ratio from dockside sampling data and the proportion of legal Chinook from the test fishery or VTR data, including parameters resulting from the beta regression model. The dotted lines represent 95% confidence bounds.	3
Figure 1.1	Comparison of modeled (FRAM model run 1811) and estimated Chinook encounters and mortalities for the Area 12 Chinook MSF from February 1 - April 30, 2012. Error bars represent 95% confidence intervals for field estimates.....	6
Figure 2.1	Comparison of modeled (FRAM model run 1512) and estimated Chinook encounters and mortalities for the Area 6 Chinook MSF from July 1 - August 15, 2012. Error bars represent 95% confidence intervals for field estimates.	9
Figure 3.1	Comparison of modeled (FRAM model run 1512) and estimated Chinook encounters and mortalities for the Area 12 Chinook MSF from July 1 - September 30, 2012. Error bars represent 95% confidence intervals for field estimates.....	14
Figure 4.1	Comparison of modeled (FRAM model run 1512) and estimated Chinook encounters and mortalities for the Area 13 Chinook MSF from May 1 - September 30, 2012. Error bars represent 95% confidence intervals for field estimates.....	18

INTRODUCTION

Based on agreements between the State of Washington and the northwest treaty Indian tribes, the Washington Department of Fish and Wildlife (WDFW) has been conducting pilot¹ recreational mark-selective Chinook fisheries (MSFs) in the marine catch areas of Puget Sound since 2003. The goal of these fisheries is to allow increased angling opportunities on hatchery-raised, marked (adipose fin-clipped) salmon while limiting impacts on unmarked (adipose fin intact; typically wild origin) stocks of conservation concern, particularly ESA-listed Puget Sound Chinook.

To monitor each fishery, WDFW's Puget Sound Sampling Unit (PSSU) implements one of the four following sampling designs: *i*) Full Murthy Estimate Design, *ii*) Reduced Murthy Estimate Design, *iii*) Aerial-Access Design or *iv*) Baseline Sampling Design. The design selected depends on area and season considerations, the magnitude of the fishery and State-Tribal agreements made prior to the start of the fishing season. For a complete description of the methods associated with these sampling designs, see WDFW's "Methods Report: Monitoring Mark-Selective Recreational Chinook Fisheries in the Marine Catch Areas of Puget Sound (Areas 5 through 13)" (WDFW 2012).

With the exception of Baseline Sampling, all above sampling designs are characterized as comprehensive, "intensive" monitoring programs and have been tailored to reliably estimate the critical parameters needed for evaluating mark-selective fisheries (WDFW 2012). In addition, PSSU has acquired and analyzed relevant data characterizing other aspects of the pilot MSFs, including descriptors of fishing effort, fishing success (catch [landed Chinook] per unit effort), recreational fishing methods, the length and age composition of encountered Chinook, and the overall intensity of our sampling efforts. As such, the data collected through these comprehensive monitoring programs allow biologists to produce weekly in-season estimates and to finalize post-season estimates of effort, catch, total encounters and fishery impacts in a timely manner.

Baseline Sampling, however, is a scaled-back monitoring program that is currently implemented in lower-magnitude MSFs and year-round in non-selective sport fisheries throughout Puget Sound. Samplers collect data on salmon catch (retained and released) and effort via dockside sampling and angler interviews and obtain on-water encounter rate data from voluntary trip reports (VTR) submitted by private anglers. In contrast to the three comprehensive monitoring programs, the data collected through Baseline Sampling does not allow for in-season or immediate post-season estimates of effort, landed catch, total encounters, or fishery impacts.

Between 2011 and 2013, a framework was developed to estimate total Chinook encounters for a given MSF relying only on Baseline Sampling data and Catch Record Card (CRC) estimates of Chinook harvest (WDFW and NWIFC 2013). Two methods were established to estimate total Chinook encounters. The first method, the "M2" approach, requires an estimate of legal-marked Chinook harvest and an estimate of the proportion of legal-marked Chinook (p_{LM}) in the target population, derived from test fishing or VTR data. Total encounters are then partitioned into size and mark-status groups using size/mark-status proportions from the test fishing or VTR data. If

¹ As stated in state-tribal agreement documents (e.g., WDFW and NWIFC 2009): "The purpose of the 'pilot' fishery is to collect information necessary to enable evaluation and planning of potential future mark-selective fisheries. The 'pilot' fishery provides a basis for determining if the data needed to estimate critical parameters can be collected and if the sample sizes needed to produce these estimates with agreed levels of precision can be realistically obtained."

the relative precision of the total encounters estimate is large due to small sample sizes in test fishing or VTR data, the “M1” approach should be employed, which estimates total encounters using CRC-based Chinook harvest estimates and the ratio of encountered Chinook to retained Chinook observed during dockside sampling efforts. In the absence of sufficient test fishing or VTR data, size/mark-status proportions are estimated using a “product method” where the mark-rate and legal proportion are estimated independently using dockside sampling data and combined to provide an estimate of the proportion for each group.

As of the date of this report, finalized CRC-based Chinook harvest estimates were available through the close of the 2012 summer season. Contained in the following sections is a full analysis of fishery-total encounters and mortalities associated with the four Puget Sound Chinook MSFs that occurred and were sampled on a Baseline level only during the time period covered by this report; October 1, 2011 through September 30, 2012 (Table 1). For previous Baseline-sampled fisheries, see WDFW 2013c. The appropriate estimation method was selected by referring to the decision support schematic provided in WDFW and NWIFC (2013). Estimates of the following parameters are presented below:

- i) total Chinook salmon harvested (by size [legal or sublegal] and mark-status [marked or unmarked] group),
- ii) total Chinook salmon released (by size and mark-status group),
- iii) total Chinook salmon mortalities (by size and mark-status group),
- iv) comparisons of Chinook salmon encounters and mortalities with pre-season expectations (based on Fishery Regulation Assessment Model [FRAM] predictions),
- v) *dockside* sample rate for harvested Chinook, and
- vi) total mortality of marked and unmarked double index tag (DIT) CWT stocks.

Table 1 CRC-based total Chinook harvest estimates and variances for each Baseline-sampled Chinook MSF in Puget Sound between October 1, 2011 and September 30, 2012, along with the recommended estimation method based on VTR sample sizes and the resulting precision of encounters estimates.

CRC Area	Season	Year	Dates	Total Chinook Harvest	Variance	Estimation Method
12	Winter	2011-12	Feb 1 – Apr 30	403	11,315	M1
6	Summer	2012	Jul 1 – Aug 15	5,541	40,995	M2
12 (S of Ayock)	Summer	2012	Jul 1 – Oct 15	2,073	82,165	M1
13	Summer	2012	May 1 – Sep 30	826	9,238	M1

The beta regression was updated to include data from all intensively monitored fisheries through the 2012-13 winter season (Figure 1). Three parameters resulting from the beta regression were used to estimate the proportion of legal Chinook in the targeted population, based on the number of retained and released Chinook in the dockside sampling and interview data: the intercept (β_0) = 1.307, slope (β_1) = -1.136 and precision (Φ) = 13.49 (for further information see WDFW & NWIFC 2013).

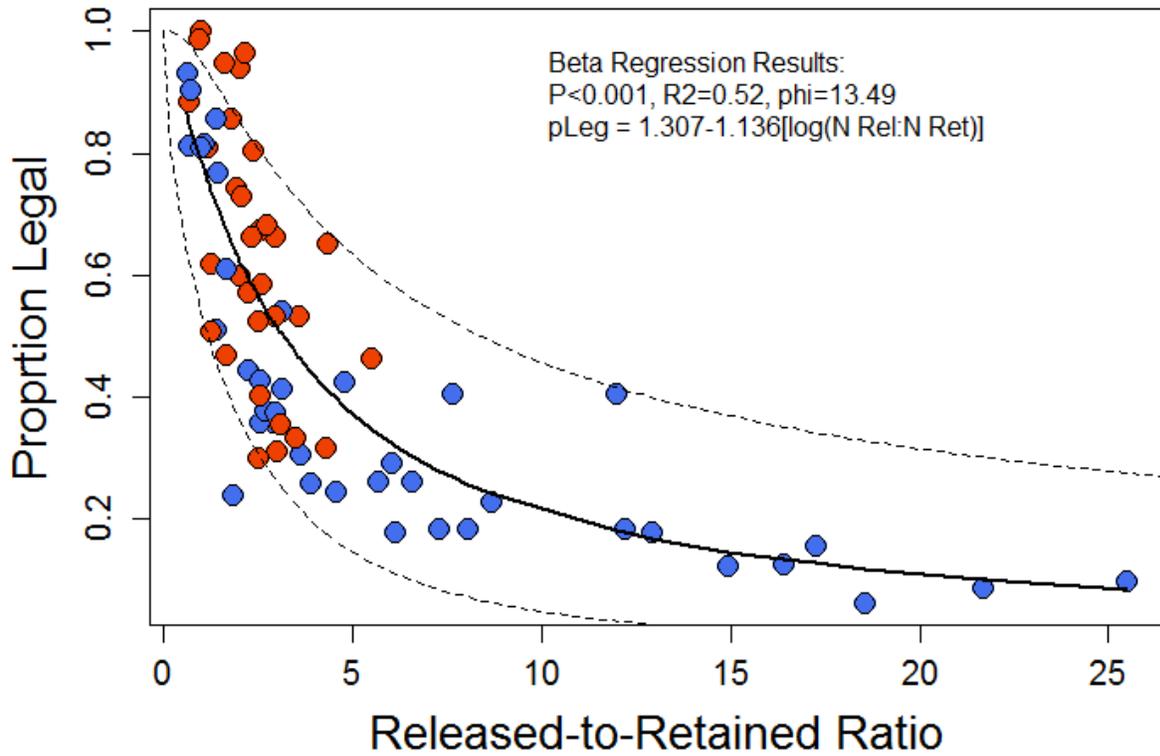


Figure 1 Beta regression results describing the relationship between released-to-retained ratio from dockside sampling data and proportion of legal Chinook from test fishery or VTR data, including parameters resulting from beta regression model. Red and blue dots represent summer and winter fisheries, respectively. Dotted lines represent 95% confidence bounds.

1 2011-12 Marine Area 12 Winter Mark-Selective Chinook Fishery

WDFW implemented a third consecutive winter Chinook MSF in Marine Area 12 from February 1 through April 30, 2012, which was monitored using baseline sampling. In the following section we present estimates of total encounters and mortalities for this fishery. These data are meant to accompany section 6 of the 2011-12 winter post-season report for MSFs in Puget Sound (WDFW 2013a), which includes information regarding sample sites, dockside sampling and interview data, and voluntary trip reports (VTR) related to the fishery. Sample sizes of VTR encounters were insufficient to provide the desired level of precision in total encounters estimates, requiring the estimation of total encounters using the M1 approach (WDFW and NWIFC 2013).

Table 1.1 Number of Chinook retained and released by mark-status, number of other salmon (positively identified species other than Chinook) released and number of salmon of unidentified species released, from dockside interviews conducted during Baseline Sampling of the Area 12 Chinook MSF from February 1 – April 30, 2012. AD = marked (adipose-clipped), UM = unmarked, UK = unknown mark.

Time Period	Chinook Retained		Chinook Released			Other Salmon Released	Unidentified Salmon Released
	AD	UM	AD	UM	UK		
Feb. 1 – Apr. 30	80	0	137	45	93	6	0

Table 1.2 Summary of VTR encounters and harvested Chinook sampled during dockside sampling for the Area 12 Chinook MSF from February 1 - April 30, 2012. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.

Data Type	LM	LU	SM	SU	Total
VTR Encounters	22	4	41	7	74
Dockside Harvest	77	0	1	0	78

Table 1.3 Summary of season-wide fishery impact estimates for the Area 12 Chinook MSF from February 1 - April 30, 2012. Release mortality rate = 0.15 for legal fish and 0.20 for sublegal fish. Values may not add up exactly due to rounding error. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.

Size/mark group	Encounters	Retained	Released	Release Mortality	Total Mortality	Var	SE	95% CI	CV (%)
LM	691	398	293	44	442	12,835	113	220 - 664	26
LU	165	0	165	25	25	829	29	0 - 81	116
SM	782	5	777	155	160	3,129	56	51 - 270	35
SU	186	0	186	37	37	1,495	39	0 - 113	104
Total	1,824	403	1,421	261	664	18,524	136	398 - 931	20

Table 1.4 Comparison of modeled (FRAM model run 1811) and estimated total Chinook encounters for the Area 12 Chinook MSF from February 1 - April 30, 2012. Values may not add up exactly due to rounding error. AD = marked (adipose-clipped), UM = unmarked.

Data Source	Group	Total Encounters	Legal	Sublegal	Landed Only
FRAM Encounters	UM	567	107	460	9
	AD	2,102	412	1,690	359
	Total	2,669	519	2,150	368
	% Marked	79	79	79	98
Estimated (Creel) Encounters	UM	351	165	186	0
	AD	1,473	691	782	403
	Total	1,824	856	968	403
	% Marked	81	81	81	100

Table 1.5 Comparison of modeled (FRAM model run 1811) and estimated total Chinook mortalities for the Area 12 Chinook MSF from February 1 - April 30, 2012. Values may not add up exactly due to rounding error. AD = marked (adipose-clipped), UM = unmarked.

Mortality Category	FRAM Chinook Mortalities			Estimated Chinook Mortalities		
	UM	AD	Total	UM	AD	Total
Total (Landed + Released)	116	723	839	62	602	664
Released Legal	15	26	41	25	44	69
Released Sublegal	92	338	430	37	155	193
Landed Only	9	359	368	0	403	403

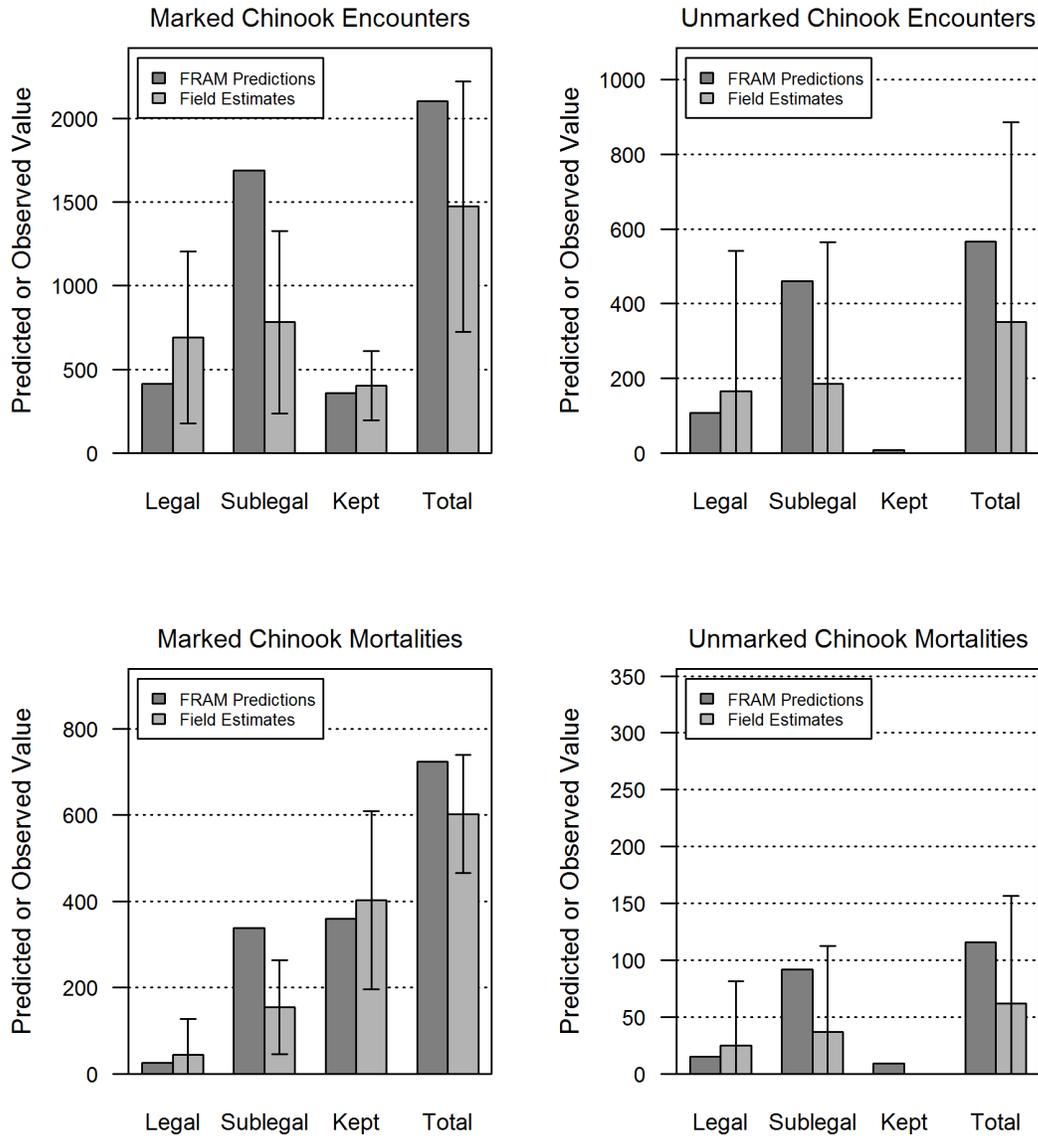


Figure 1.1 Comparison of modeled (FRAM model run 1811) and estimated Chinook encounters and mortalities for the Area 12 Chinook MSF from February 1 - April 30, 2012. Error bars represent 95% confidence intervals for field estimates.

Table 1.6 Season total sample rate (Total retained Chinook sampled during baseline sampling / Estimated retained Chinook) in the Area 12 Chinook MSF from February 1 - April 30, 2012. AD = marked (adipose-clipped), UM = unmarked.

Time period	Estimated Retained Chinook			Number of Chinook Sampled			Sample Rate
	AD	UM	Total	AD	UM	Total	
Feb. 1 – Apr. 30	403	0	403	78	0	78	19.4%

Table 1.7 Summary of double-index tagged (DIT) Chinook kept by anglers, and estimated total mortality of unmarked DIT Chinook due to hook-and-release impacts resulting from the Area 12 Chinook MSF from February 1 - April 30, 2012. AD = marked (adipose-clipped), UM = unmarked.

Hatchery	Brood Year	DITs Obs'd	AD DIT Harvest		UM DIT Enc.	UM DIT Mortality		
			Est.	var(Est.)		Est.	var(Est.)	SE(Est.)
Chilliwack River Hatchery	2009	1	5.2	21.5	2.7	0.3	0.057	0.24
Wallace River Hatchery	2009	1	5.2	21.5	5.1	0.5	0.214	0.46
Total		2	10.3	43.1	7.8	0.8	0.271	0.70

Table 1.8 Season-total estimates of Chinook encounters by size/mark-status and total estimates of angler effort, summarized for all previous seasons of the Area 12 winter Chinook MSF. Values may not add exactly due to rounding error. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.

Season Dates	Effort (Angler-trips)	Retained Chinook				Released Chinook				Total Encounters
		LM	LU	SM	SU	LM	LU	SM	SU	
Feb 1 - Apr 30, 2010	1,736	244	0	8	0	176	79	262	51	818
Feb 1 - Apr 30, 2011	2,425	424	6	6	0	252	148	364	84	1,283
Feb 1 - Apr 30, 2012	2,299	398	0	5	0	293	165	777	186	1,824

2 2012 Marine Area 6 Summer Mark-Selective Chinook Fishery

WDFW implemented a tenth consecutive summer Chinook MSF in Marine Area 6 from July 1 through August 15, 2012. This fishery has been monitored using baseline sampling since 2008. In the following section we present estimates of total encounters and mortalities for this fishery. These data are meant to accompany section 2 of the 2012 summer post-season report for MSFs in Puget Sound (WDFW 2013b), which includes information regarding sample sites, dockside sampling and interview data, and voluntary trip reports (VTR) related to the fishery. Sample sizes of VTR encounters were sufficient to provide the desired level of precision in total encounters estimates allowing the use of the bias-corrected M2 approach (WDFW and NWIFC 2013).

Table 2.1 Summary of VTR encounters and harvested Chinook sampled during dockside sampling for the Area 6 Chinook MSF from July 1 - August 15, 2012. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.

Data Type	LM	LU	SM	SU	Total
VTR Encounters	157	45	25	31	258
Dockside Harvest	1701	4	13	0	1718

Table 2.2 Summary of season-wide fishery impact estimates for the Area 6 Chinook MSF from July 1 - August 15, 2012. Release mortality rate = 0.15 for legal fish and 0.20 for sublegal fish. Values may not add up exactly due to rounding error. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.

Size/mark group	Encounters	Retained	Released	Release Mortality	Total Mortality	Var	SE	95% CI	CV (%)
LM	6,306	5,486	820	123	5,609	46,938	217	5,184 - 6,034	4
LU	1,807	13	1,795	269	282	1,674	41	202 - 362	15
SM	1,004	42	962	192	234	1,754	42	152 - 316	18
SU	1,245	0	1,245	249	249	1,998	45	161 - 337	18
Total	10,363	5,541	4,822	834	6,375	52,818	230	5,924 - 6,825	4

Table 2.3 Comparison of modeled (FRAM model run 1512) and estimated total Chinook encounters for the Area 6 Chinook MSF from July 1 - August 15, 2012. Values may not add up exactly due to rounding error. AD = marked (adipose-clipped), UM = unmarked.

Data Source	Group	Total Encounters	Legal	Sublegal	Landed Only
FRAM Encounters	UM	1,261	866	395	9
	AD	2,839	1,354	1,485	1,178
	Total	4,100	2,220	1,880	1,187
	% Marked	69	61	79	99
Estimated (Creel) Encounters	UM	3,053	1,807	1,245	13
	AD	7,310	6,306	1,004	5,528
	Total	10,363	8,113	2,249	5,541
	% Marked	71	78	45	100

Table 2.4 Comparison of modeled (FRAM model run 1512) and estimated total Chinook mortalities for the Area 6 Chinook MSF from July 1 - August 15, 2012. Values may not add up exactly due to rounding error. AD = marked (adipose-clipped), UM = unmarked.

Mortality Category	FRAM Chinook Mortalities			Estimated Chinook Mortalities		
	UM	AD	Total	UM	AD	Total
Total (Landed + Released)	217	1,561	1,778	531	5,844	6,375
Released Legal	129	86	215	269	123	392
Released Sublegal	79	297	376	249	192	441
Landed Only	9	1,178	1,187	13	5,528	5,541

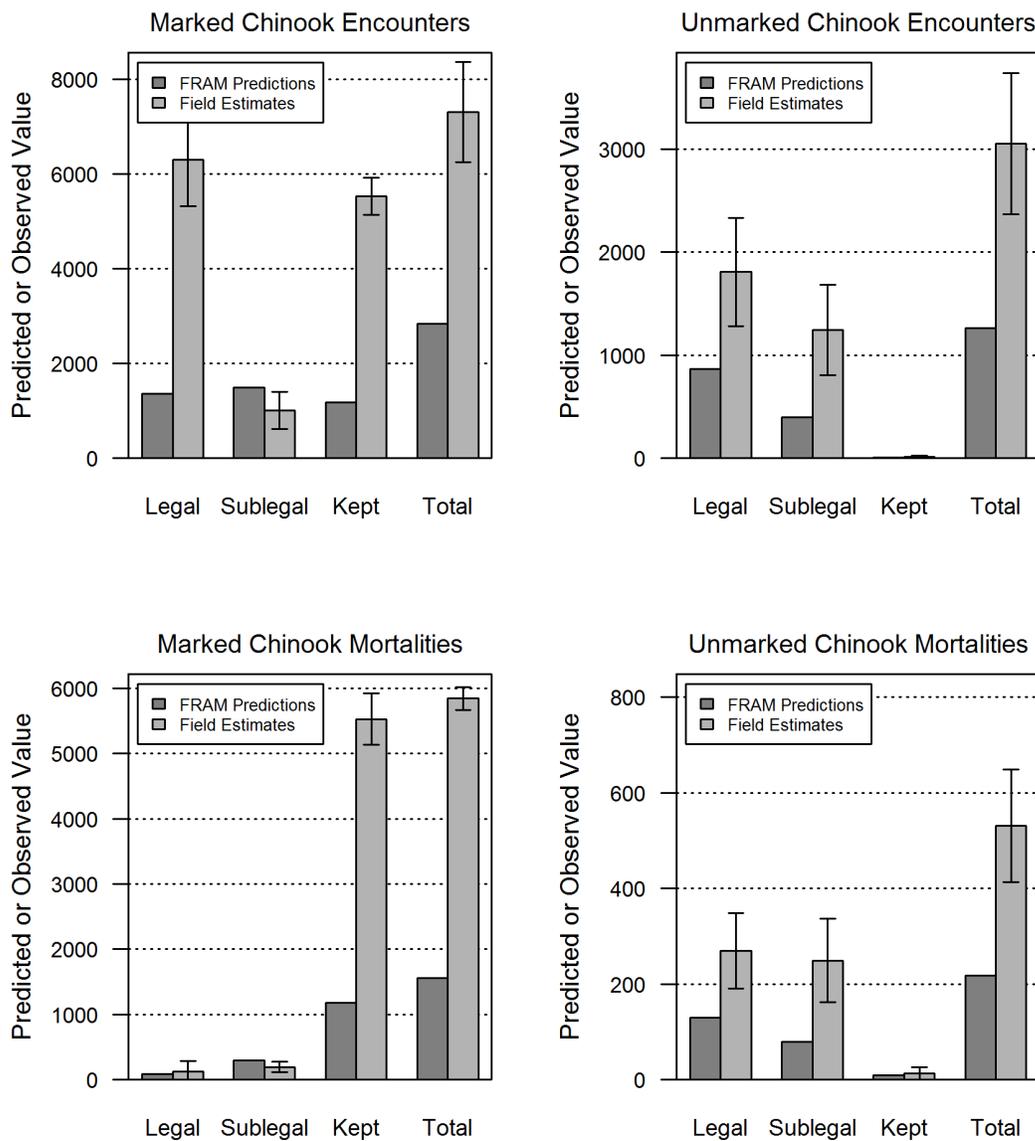


Figure 2.1 Comparison of modeled (FRAM model run 1512) and estimated Chinook encounters and mortalities for the Area 6 Chinook MSF from July 1 - August 15, 2012. Error bars represent 95% confidence intervals for field estimates.

Table 2.5 Season total sample rate (Total retained Chinook sampled during baseline sampling / Estimated retained Chinook) in the Area 6 Chinook MSF from July 1 - August 15, 2012. AD = marked (adipose-clipped), UM = unmarked.

Time period	Estimated Retained Chinook			Number of Chinook Sampled			Sample Rate
	AD	UM	Total	AD	UM	Total	
Jul. 1 – Aug. 15	5,528	13	5,541	1,714	4	1,718	31.0%

Table 2.6 Summary of double-index tagged (DIT) Chinook kept by anglers, and estimated total mortality of unmarked DIT Chinook due to hook-and-release impacts resulting from the Area 6 Chinook MSF from July 1 - August 15, 2012. AD = marked (adipose-clipped), UM = unmarked.

Hatchery	Brood Year	DITs Obs'd	AD DIT Harvest		UM DIT Enc.	UM DIT Mortality		
			Est.	var(Est.)		Est.	var(Est.)	SE(Est.)
Big Creek Hatchery	2009	3	9.7	21.5	9.6	1	0.214	0.8
Clear Creek Hatchery	2009	3	9.7	21.5	9.7	1	0.217	0.8
George Adams Hatchery	2008	1	3.2	7.2	3.2	0.3	0.071	0.3
	2009	18	58.1	129.2	58.2	5.8	1.296	4.8
Grovers Creek Hatchery	2008	1	3.2	7.2	3.6	0.4	0.089	0.3
	2009	9	29	64.6	28	2.8	0.602	2.3
Chilliwack River Hatchery	2010	1	3.2	7.2	1.6	0.2	0.017	0.1
McKenzie Hatchery	2008	1	3.2	7.2	0.02	0.002	0.000	0.001
Samish Hatchery	2008	1	3.2	7.2	3.2	0.3	0.073	0.3
	2009	6	16.1	35.9	19.6	4.9	7.545	4
Soos Creek Hatchery	2007	1	3.2	7.2	3.2	0.3	0.072	0.3
	2009	1	3.2	7.2	3.4	0.3	0.079	0.3
Spring Creek NFH	2008	1	3.2	7.2	3.2	0.3	0.072	0.3
	2009	5	16.1	35.9	16.2	1.6	0.36	1.3
Wallace River Hatchery	2008	1	3.2	7.2	3.2	0.3	0.072	0.3
	2009	1	3.2	7.2	3.2	0.3	0.071	0.3
Total		54	170.9	380.4	169.2	19.8	10.85	16.46

Table 2.7 Season-total estimates of Chinook encounters by size/mark-status and total estimates of angler effort, summarized for all previous seasons of the Area 6 summer Chinook MSF. Values may not add exactly due to rounding error. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.

Season Dates	Effort (Angler-trips)	Retained Chinook				Released Chinook				Total Encounters
		LM	LU	SM	SU	LM	LU	SM	SU	
Jul 5 – Aug 3, 2003	5,195	941	22	0	0	141	1,283	52	103	2,542
Jul 1 – Aug 8, 2004	4,251	667	5	2	0	100	820	42	11	1,649
Jul 1 – Aug 10, 2005	3,971	404	0	0	4	60	790	70	0	1,323
Jul 1 – Aug 21, 2006	3,077	338	0	2	8	50	494	0	0	882
Jul 1 – Aug 9, 2007	3,221	715	7	7	0	107	404	9	0	1,249
Jul 1 – Aug 9, 2008	2,812	535	2	0	0	80	378	0	15	1,011
Jul 1 – Aug 6, 2009	9,394	2,336	0	36	0	349	1,216	193	275	4,406
Jul 1 – Aug 15, 2010	4,744	1,394	2	4	0	208	544	41	27	2,220
Jul 1 – Aug 15, 2011	10,463	3,202	7	97	14	479	1,746	634	512	6,690
Jul 1 – Aug 15, 2012	10,413	5,486	13	42	0	820	1,795	962	1,245	10,363

3 2012 Marine Area 12 Summer Mark-Selective Chinook Fishery

WDFW implemented a summer Chinook MSF, monitored using Baseline Sampling, South of Ayock Point in Marine Area 12 from July 1 through September 30, 2012 for the first time. In the following section we present estimates of total encounters and mortalities for this fishery. These data are intended to accompany section 6 of the 2012 summer post-season report for MSFs in Puget Sound (WDFW 2013b), which includes information regarding sample sites, dockside sampling and interview data, and voluntary trip reports (VTR) related to the fishery. Sample sizes of VTR encounters were insufficient, requiring the estimation of total encounters using the M1 approach (WDFW and NWIFC 2013).

Table 3.1 Number of Chinook retained and released by mark-status, number of other salmon (positively identified species other than Chinook) released and number of salmon of unidentified species released, from dockside interviews conducted during Baseline Sampling of the Area 12 Chinook MSF from July 1 – September 30, 2012. AD = marked (adipose-clipped), UM = unmarked, UK = unknown mark.

Year	Chinook Retained		Chinook Released			Other Salmon Released	Unidentified Salmon Released
	AD	UM	AD	UM	UK		
2012	92	1	74	79	89	52	7

Table 3.2 Summary of VTR encounters and harvested Chinook sampled during dockside sampling for the Area 12 Chinook MSF from July 1 - September 30, 2012. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.

Data Type	LM	LU	SM	SU	Total
VTR Encounters	24	0	4	0	28
Dockside Harvest	108	1	1	0	110

Table 3.3 Summary of season-wide fishery impact estimates for the Area 12 Chinook MSF from July 1 - September 30, 2012. Release mortality rate = 0.15 for legal fish and 0.20 for sublegal fish. Values may not add up exactly due to rounding error. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.

Size/mark group	Encounters	Retained	Released	Release Mortality	Total Mortality	Var	SE	95% CI	CV (%)
LM	2,566	2,035	531	80	2,115	91,570	303	1,522 - 2,708	14
LU	1,446	19	1,427	214	233	8,306	91	54 - 412	39
SM	1,746	19	1,727	345	364	15,223	123	122 - 606	34
SU	984	0	984	197	197	13,262	115	0 - 422	59
Total	6,742	2,073	4,669	836	2,909	129,921	360	2,202 - 3,615	12

Table 3.4 Comparison of modeled (FRAM model run 1512) and estimated total Chinook encounters for the Area 12 Chinook MSF from July 1 - September 30, 2012. Values may not add up exactly due to rounding error. AD = marked (adipose-clipped), UM = unmarked.

Data Source	Group	Total Encounters	Legal	Sublegal	Landed Only
FRAM Encounters	UM	471	96	375	8
	AD	2,061	531	1,530	462
	Total	2,532	627	1,905	470
	% Marked	81	85	80	98
Estimated (Creel) Encounters	UM	2,430	1,446	984	19
	AD	4,312	2,566	1,746	2,054
	Total	6,742	4,012	2,730	2,073
	% Marked	64	64	64	99

Table 3.5 Comparison of modeled (FRAM model run 1512) and estimated total Chinook mortalities for the Area 12 Chinook MSF from July 1 - September 30, 2012. Values may not add up exactly due to rounding error. AD = marked (adipose-clipped), UM = unmarked.

Mortality Category	FRAM Chinook Mortalities			Estimated Chinook Mortalities		
	UM	AD	Total	UM	AD	Total
Total (Landed + Released)	97	802	899	430	2,479	2,909
Released Legal	14	34	48	214	80	294
Released Sublegal	75	306	381	197	345	542
Landed Only	8	462	470	19	2,054	2,073

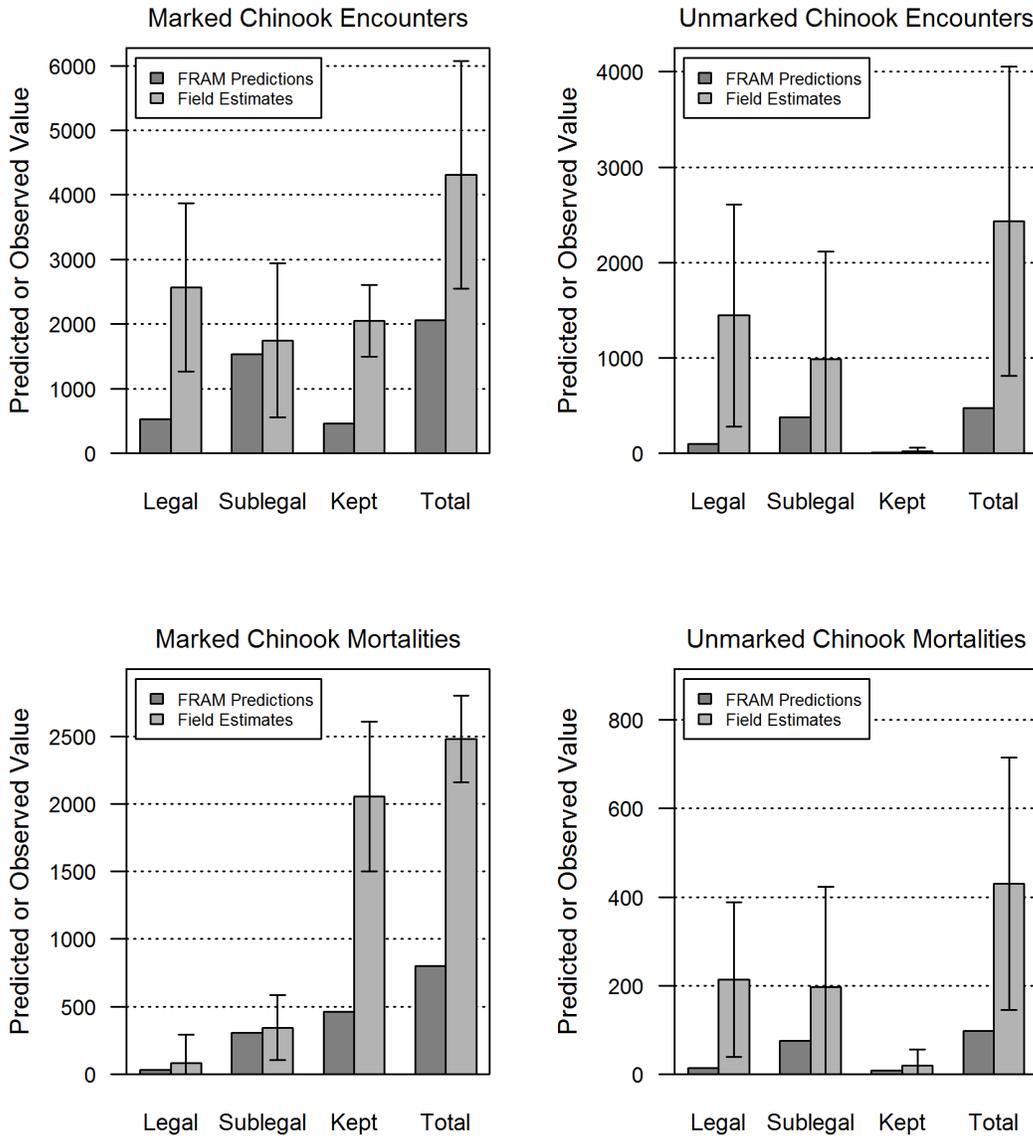


Figure 3.1 Comparison of modeled (FRAM model run 1512) and estimated Chinook encounters and mortalities for the Area 12 Chinook MSF from July 1 - September 30, 2012. Error bars represent 95% confidence intervals for field estimates.

Table 3.6 Season total sample rate (Total retained Chinook sampled during baseline sampling / Estimated retained Chinook) in the Area 12 Chinook MSF from July 1 - September 30, 2011. AD = marked (adipose-clipped), UM = unmarked.

Time period	Estimated Retained Chinook			Number of Chinook Sampled			Sample Rate
	AD	UM	Total	AD	UM	Total	
Jul. 1 – Sep. 30	2,054	19	2,073	109	1	110	5.3%

Table 3.7 Summary of double-index tagged (DIT) Chinook kept by anglers, and estimated total mortality of unmarked DIT Chinook due to hook-and-release impacts resulting from the Area 12 Chinook MSF from July 1 - September 30, 2012. AD = marked (adipose-clipped), UM = unmarked.

Hatchery	Brood Year	DITs Obs'd	AD DIT Harvest		UM DIT Enc.	UM DIT Mortality		
			Est.	var(Est.)		Est.	var(Est.)	SE(Est.)
George Adams Hatchery	2009	1	18.8	336.31	18.9	1.9	3.375	1.84
Total		1	18.8	336.31	18.9	1.9	3.375	1.84

4 2012 Marine Area 13 Summer Mark-Selective Chinook Fishery

WDFW implemented a sixth consecutive summer Chinook MSF in Marine Area 13 from May 1 through September 30, 2012, monitored using baseline sampling. In the following section we present estimates of total encounters and mortalities for this fishery. These data are intended to accompany section 7 of the 2012 summer post-season report for MSFs in Puget Sound (WDFW 2013b), which includes information regarding sample sites, dockside sampling and interview data, and voluntary trip reports (VTR) related to the fishery. Sample sizes of VTR encounters were insufficient to provide the desired level of precision in total encounters estimates, requiring the estimation of total encounters using the M1 approach (WDFW and NWIFC 2013).

Table 4.1 Number of Chinook retained and released by mark-status, number of other salmon (positively identified species other than Chinook) released and number of salmon of unidentified species released, from dockside interviews conducted during Baseline Sampling of the Area 13 Chinook MSF from May 1 – September 30, 2012. AD = marked (adipose-clipped), UM = unmarked, UK = unknown mark.

Year	Chinook Retained		Chinook Released			Other Salmon Released	Unidentified Salmon Released
	AD	UM	AD	UM	UK		
2012	77	0	43	27	56	35	31

Table 4.2 Summary of VTR encounters and harvested Chinook sampled during dockside sampling for the Area 13 Chinook MSF from May 1 - September 30, 2012. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.

Data Type	LM	LU	SM	SU	Total
VTR Encounters	7	2	1	0	10
Dockside Harvest	71	0	2	0	73

Table 4.3 Summary of season-wide fishery impact estimates for the Area 13 Chinook MSF from May 1 - September 30, 2012. Release mortality rate = 0.15 for legal fish and 0.20 for sublegal fish. Values may not add up exactly due to rounding error. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.

Size/mark group	Encounters	Retained	Released	Release Mortality	Total Mortality	Var	SE	95% CI	CV (%)
LM	1,159	803	355	53	857	10,908	104	652 - 1,061	12
LU	406	0	406	61	61	1,358	37	0 - 133	60
SM	712	23	689	138	160	2,866	54	55 - 265	33
SU	250	0	250	50	50	2,359	49	0 - 145	97
Total	2,526	826	1,700	302	1,128	17,486	132	869 – 1,387	12

Table 4.4 Comparison of modeled (FRAM model run 1512) and estimated total Chinook encounters for the Area 13 Chinook MSF from May 1 - September 30, 2012. Values may not add up exactly due to rounding error. AD = marked (adipose-clipped), UM = unmarked.

Data Source	Group	Total Encounters	Legal	Sublegal	Landed Only
FRAM Encounters	UM	523	123	400	11
	AD	4,705	1,590	3,115	1,383
	Total	5,228	1,713	3,515	1,394
	% Marked	90	93	89	99
Estimated (Creel) Encounters	UM	656	406	250	0
	AD	1,870	1,159	712	826
	Total	2,526	1,565	961	826
	% Marked	74	74	74	100

Table 4.5 Comparison of modeled (FRAM model run 1512) and estimated total Chinook mortalities for the Area 13 Chinook MSF from May 1 - September 30, 2012. Values may not add up exactly due to rounding error. AD = marked (adipose-clipped), UM = unmarked.

Mortality Category	FRAM Chinook Mortalities			Estimated Chinook Mortalities		
	UM	AD	Total	UM	AD	Total
Total (Landed + Released)	108	2,106	2,214	111	1,017	1,128
Released Legal	17	100	117	61	53	114
Released Sublegal	80	623	703	50	138	188
Landed Only	11	1,383	1,394	0	826	826

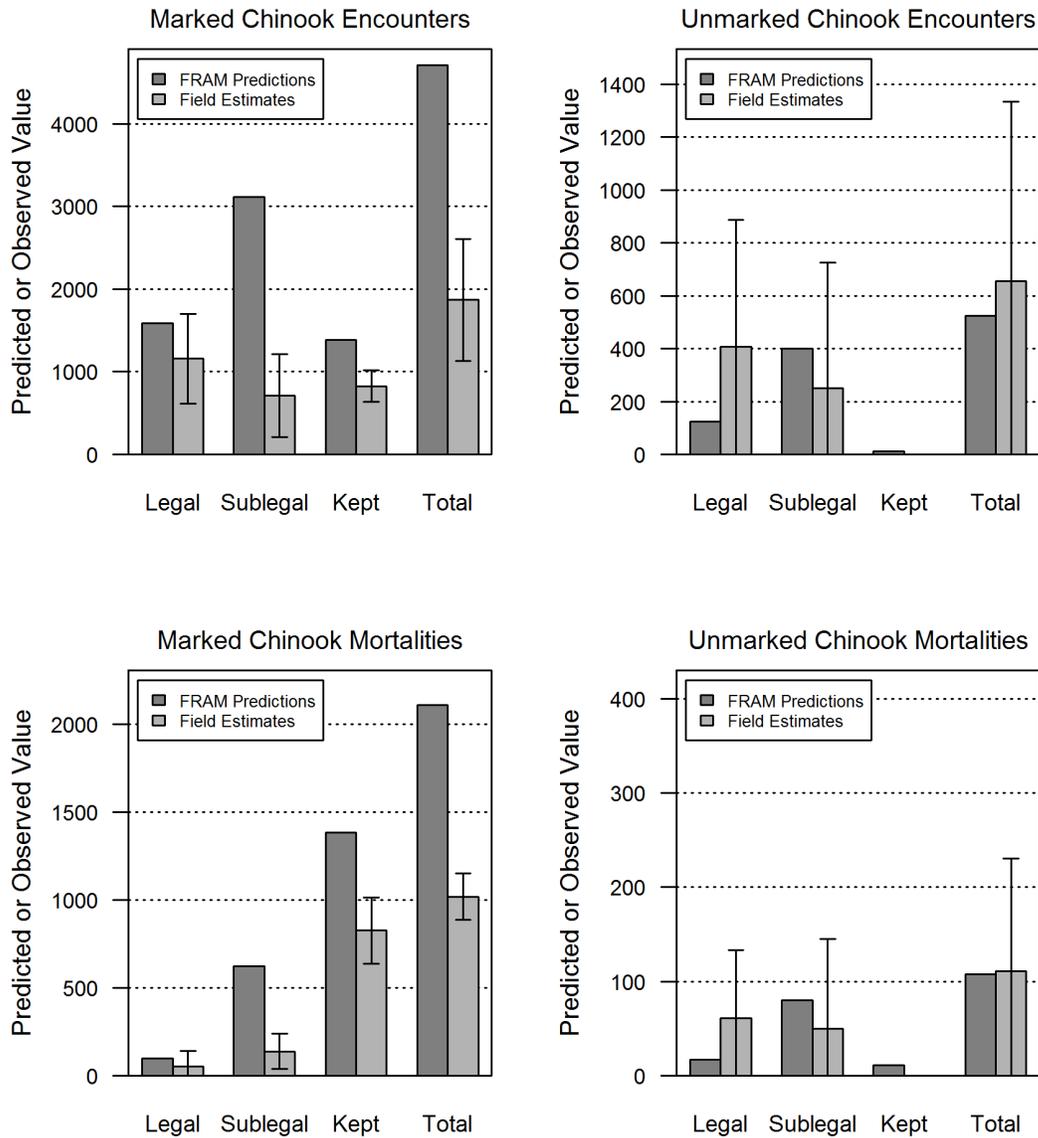


Figure 4.1 Comparison of modeled (FRAM model run 1512) and estimated Chinook encounters and mortalities for the Area 13 Chinook MSF from May 1 - September 30, 2012. Error bars represent 95% confidence intervals for field estimates.

Table 4.6 Season total sample rate (Total retained Chinook sampled during baseline sampling / Estimated retained Chinook) in the Area 13 Chinook MSF from May 1 - September 30, 2012. AD = marked (adipose-clipped), UM = unmarked.

Time period	Estimated Retained Chinook			Number of Chinook Sampled			Sample Rate
	AD	UM	Total	AD	UM	Total	
May 1 – Sep. 30	826	0	826	73	0	73	8.8%

Table 4.7 Summary of double-index tagged (DIT) Chinook kept by anglers, and estimated total mortality of unmarked DIT Chinook due to hook-and-release impacts resulting from the Area 13 Chinook MSF from May 1 - September 30, 2012. AD = marked (adipose-clipped), UM = unmarked.

Hatchery	Brood Year	DITs Obs'd	AD DIT Harvest		UM DIT Enc.	UM DIT Mortality		
			Est.	var(Est.)		Est.	var(Est.)	SE(Est.)
George Adams Hatchery	2009	1	11.3	116.72	11.3	1.1	1.171	1.08
Total		1	11.3	116.72	11.3	1.1	1.171	1.08

Table 4.8 Season-total estimates of Chinook encounters by size/mark-status and total estimates of angler effort, summarized for all previous seasons of the Area 13 summer Chinook MSF. Values may not add exactly due to rounding error. LM = legal-sized marked, LU = legal-sized unmarked, SM = sublegal-sized marked, SU = sublegal-sized unmarked.

Season Dates	Effort (Angler-trips)	Retained Chinook				Released Chinook				Total Encounters
		LM	LU	SM	SU	LM	LU	SM	SU	
May 1 – Sep 30, 2007	28,080	2,697	78	101	0	1,095	1,648	2,032	971	8,622
May 1 – Sep 30, 2008	22,494	1,327	0	8	0	198	197	238	98	2,067
May 1 – Sep 30, 2009	40,967	1,172	24	72	0	839	471	1,227	320	4,125
May 1 – Sep 30, 2010	27,060	646	21	0	0	97	85	106	35	990
May 1 – Sep 30, 2011	15,818	1,006	8	8	0	266	268	250	56	1,861
May 1 – Sep 30, 2012	24,384	803	0	23	0	355	406	689	250	2,526

REFERENCES

- Washington Department of Fish and Wildlife (WDFW). 2012. Methods Report: Monitoring Mark-Selective Recreational Chinook Fisheries In the Marine Catch Areas of Puget Sound (Areas 5 through 13). Revised Draft Report: January 30, 2012. Washington Department of Fish and Wildlife. Olympia, Washington. 81 pp. <http://wdfw.wa.gov/publications/01357/>
- Washington Department of Fish and Wildlife (WDFW). 2013a. 2011-2012 Winter Mark-Selective Recreational Chinook Fisheries In Marine Areas 7, 8-1, 8-2, 9, 10, 11 and 12: Post-season Report. Revised Draft Report: January 24, 2013. Washington Department of Fish and Wildlife. Olympia, Washington. 90 pp. <http://wdfw.wa.gov/publications/01533/>
- Washington Department of Fish and Wildlife (WDFW). 2013b. 2012 Summer Mark-Selective Recreational Chinook Fisheries In Marine Areas 5, 6, 9, 10, 11, 12 and 13: Post-season Report. Revised Draft Report: February 26, 2013. Washington Department of Fish and Wildlife. Olympia, Washington. 91 pp. <http://wdfw.wa.gov/publications/01534/>
- Washington Department of Fish and Wildlife (WDFW). 2013c. Total Encounters and Mortality Estimates for Puget Sound Recreational Chinook Mark-Selective Fisheries Monitored using Baseline Sampling: 2007-2011. Draft Report: November 27, 2013. Olympia, Washington.
- Washington Department of Fish and Wildlife (WDFW) and Northwest Indian Fisheries Commission (NWIFC). 2013. Estimating Total Chinook Encounters using Catch Record Card-Based Estimates of Harvest. Draft Report: November 26, 2013. Olympia, Washington.